

We claim:

- 1 1. A composition for transfecting a eukaryotic cell which
2 comprises a peptide-nucleic acid complex and a cationic
3 lipid capable of aggregating said peptide-nucleic acid
4 complex.
- 1 2. The composition of claim 1 wherein said peptide is a
2 fusagenic peptide or a nuclear localization signal
3 sequence.
- 1 3. The composition of claim 2 wherein said fusagenic peptide
2 is a peptide of a viral fusagenic protein.
- 1 4. The composition of claim 3 wherein said viral fusagenic
2 protein is derived from a virus selected from the group
3 consisting of an influenza virus, a vesicular stomatitis
4 virus and an alphavirus.
- 1 5. The composition of claim 3 wherein said viral fusagenic
2 protein is a hemagglutinin of an influenza virus or a
3 glycoprotein of a vesicular stomatitis virus.
- 1 6. The composition of claim 5 wherein said viral fusagenic
2 peptide is an amphiphilic peptide of a hemagglutinin of an
3 influenza virus.
- 1 7. The composition of claim 6 wherein said amphiphilic peptide
2 is a K5 peptide or an E5 peptide of a hemagglutinin.
- 1 8. The composition of claim 2 wherein said nuclear
2 localization signal sequence is derived from a simian virus
3 40.
- 1 9. The composition of claim 2 wherein said nuclear
2 localization signal sequence is derived from the SV40 large
3 T antigen.

- 1 10. The composition of claim 1 wherein said peptide is poly-L-
2 lysine.
- 1 11. The composition of claim 1 wherein said cationic lipid is
2 a polyvalent cationic lipid.
- 1 12. The composition of claim 11 wherein said polyvalent
2 cationic lipid is 2,3-dioleyloxy-N-
3 [2(sperminecarboxamido)ethyl]-N,N-dimethyl-1-propanaminium
4 trifluoroacetate.
- 1 13. The composition of claim 1 further comprising a neutral
2 lipid.
- 1 14. The composition of claim 13 wherein said neutral lipid is
2 dioleoylphosphatidylethanolamine.
- 1 15. The composition of claim 13 which is capable of
2 transfecting an animal primary cell line.
- 1 16. The composition of claim 13 which is capable of
2 transfecting a human primary cell line.
- 1 17. The composition of claim 13 which is capable of
2 transfecting a fibroblast.
- 1 18. A composition for transfecting a eukaryotic cell which
2 comprises a peptide-nucleic acid complex, wherein said
3 peptide is conjugated to a DNA binding group, and a
4 cationic lipid capable of aggregating said peptide-nucleic
5 acid complex.
- 1 19. The composition of claim 18 wherein said peptide is a
2 fusagenic peptide or a modified nuclear localization signal
3 sequence.

- 1 20. The composition of claim 19 wherein said fusagenic peptide
2 is a peptide of a viral fusagenic protein.
- 1 21. The composition of claim 20 wherein said viral fusagenic
2 protein is derived from a virus selected from the group
3 consisting of an influenza virus, a vesicular stomatitis
4 virus and an alphavirus.
- 1 22. The composition of claim 20 wherein said viral fusagenic
2 protein is a hemagglutinin of an influenza virus or a
3 glycoprotein of a vesicular stomatitis virus.
- 1 23. The composition of claim 20 wherein said viral fusagenic
2 peptide is an amphiphilic peptide of a hemagglutinin of an
3 influenza virus.
- 1 24. The composition of claim 23 wherein said amphiphilic
2 peptide is a K5 peptide or an E5 peptide of a
3 hemagglutinin.
- 1 25. The composition of claim 19 wherein said nuclear
2 localization signal sequence is derived from a simian virus
3 40.
- 1 26. The composition of claim 19 wherein said nuclear
2 localization signal sequence is derived from the SV40 large
3 T antigen.
- 1 27. The composition of claim 18 wherein said peptide is poly-L-
2 lysine.
- 1 28. The composition of claim 18 wherein said DNA binding group
2 is selected from the group consisting of proteins,
3 peptides, polypeptides and polyamines.
- 1 29. The composition of claim 18 wherein said DNA binding group
2 is a polyamine.

- 1 30. The composition of claim 29 wherein said polyamine is
2 spermine.
- 1 31. The composition of claim 18 wherein said DNA binding group
2 is capable of forming a noncovalent association with the
3 nucleic acid.
- 1 32. The composition of claim 31 wherein said noncovalent
2 association is selected from the group consisting of
3 hydrogen bonds, salt bridges, van der Waals forces and
4 conformational interactions.
- 1 33. The composition of claim 18 wherein said cationic lipid is
2 a polyvalent cationic lipid.
- 1 34. The composition of claim 33 wherein said polyvalent
2 cationic lipid is 2,3-dioleyloxy-N-
3 [2(sperminecarboxamido)ethyl]-N,N-dimethyl-1-propanaminium
4 trifluoroacetate.
- 1 35. The composition of claim 18 further comprising a neutral
2 lipid.
- 1 36. The composition of claim 35 wherein said neutral lipid is
2 dioleoylphosphatidylethanolamine.
- 1 37. A method for transfecting a eukaryotic cell with a nucleic
2 acid which comprises contacting said cell with the
3 transfection composition of claim 1.
- 1 38. A method for transfecting a eukaryotic cell with a nucleic
2 acid, said method comprising the steps of:
3 (a) admixing a peptide with a nucleic acid to form a
4 peptide-nucleic acid complex;
5 (b) adding cationic lipid to the complex from step (a) to
6 obtain a cationic lipid aggregate comprising said
7 peptide-nucleic acid complex; and

8 (c) contacting said eukaryotic cell with the cationic
9 lipid aggregate from step (b).

1 39. The method of claim 38 wherein said peptide is a fusagenic
2 peptide or a nuclear localization signal sequence.

1 40. The method of claim 39 wherein said fusagenic peptide is a
2 peptide of a viral protein derived from a virus selected
3 from the group consisting of an influenza virus, a
4 vesicular stomatitis virus and an alphavirus.

1 41. The method of claim 40 wherein said viral fusagenic protein
2 is a hemagglutinin of an influenza virus or a glycoprotein
3 of a vesicular stomatitis virus.

1 42. The method of claim 41 wherein said viral fusagenic peptide
2 is an amphiphilic peptide of a hemagglutinin of an
3 influenza virus.

1 43. The method of claim 42 wherein said amphiphilic peptide is
2 a K5 peptide or an E5 peptide of a hemagglutinin.

1 44. The method of claim 39 wherein said nuclear localization
2 signal sequence is derived from a simian virus 40.

1 45. The method of claim 39 wherein said nuclear localization
2 signal sequence is derived from the SV40 large T antigen.

1 46. The method of claim 38 wherein said peptide is poly-L-
2 lysine.

1 47. The method of claim 38 wherein said peptide is conjugated
2 to a DNA binding group.

1 48. The method of claim 47 wherein said DNA binding group is a
2 polyamine.

- 1 49. The method of claim 48 wherein said polyamine is spermine.
- 1 50. The method of claim 38 wherein said cationic lipid is a
2 polyvalent cationic lipid.
- 1 51. The method of claim 50 wherein said polyvalent cationic
2 lipid is 2,3-dioleyloxy-N-[2(sperminecarboxamido)ethyl]-
3 N,N-dimethyl-1-propanaminium trifluoroacetate.
52. The method of claim 38 further comprising a neutral lipid.
- 1 53. The method of claim 52 wherein said neutral lipid is
2 dioleoylphosphatidylethanolamine.
- 1 54. The method of claim 53 wherein said eukaryotic cell is an
2 animal primary cell line.
- 1 55. The method of claim 53 wherein said eukaryotic cell is a
2 human primary cell line.
- 1 56. The method of claim 53 wherein said eukaryotic cell is a
2 fibroblast.